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days, and 6 specimens lived 176 to 217 days. A single specimen of *Culex territans* survived 265 days on a diet exclusively of fruit juices at a temperature of 48° to 76° F.

2. Plasmodia of malaria distinctly recognizable by their morphology and staining were detected in the salivary glands of five specimens of *A. punctipennis*, 68, 70, 71, 83, and 92 days, respectively, after infection. These mosquitoes had been allowed to bite a crescent carrier on a single occasion and were maintained at room temperature (59° to 83° F.) for 6 days, then kept in a container registering temperatures of 44° to 78° F. for the remainder of the experiment.

3. Plasmodia of malaria proved to be viable by inoculation into a human host from the bite of a mosquito infected 55 days previously. Mosquitoes failed to convey malaria plasmodia through their biting, 61, 66, and 67 days, respectively, after becoming infected (gland sporozoites obtained). These three mosquitoes were kept under conditions identical with those in which viable sporozoites were demonstrated in the five specimens mentioned above.

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## ON THE PROBABLE IDENTITY OF THE CHITTENDEN-UNDERHILL PELLAGRALIKE SYNDROME IN DOGS AND "BLACK-TONGUE."

### WITH REPORT OF NECROPSY FINDINGS IN TWO CASES OF BLACK-TONGUE.

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We desire to invite attention to the striking similarity and probable identity of Chittenden and Underhill's pellagralike syndrome in dogs and the condition known to American veterinarians as "black-tongue."<sup>1</sup>

In August, 1917, Chittenden and Underhill reported the production in dogs of a pathological condition which they regarded as closely resembling human pellagra. The condition was described as follows:

"The onset of the pathological symptoms is generally very sudden. Usually the first abnormal manifestation is a refusal to eat, and examination will reveal nothing to account for the loss of appetite. The animal lies quietly in its pen and is apathetic. After continued refusal to eat for a day or two, the mouth of the dog will present a peculiar and characteristic appearance. The inner surface of the cheeks and lips and the edges of the tongue are so covered with pustules as to give the impression of a mass of rotten flesh. The odor from these tissues is foul and almost unbearable. When stroked with absorbent cotton the mucous lining of the mouth comes

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<sup>1</sup> Synonyms: Sore mouth, southern canine plague, dog typhus, dog typhoid, gastroenteritis hemorrhagica, Stuttgart dog epizootic.

away in shreds. Intense salivation is present. The teeth appear to be solid and normal. A bloody diarrhea is present, attempts at defecation being very frequent and resulting in the passage of little more than a bloody fluid of foul odor. In some cases, the thorax and upper part of the abdomen may contain many pustules half an inch in diameter which are filled with pus organisms. No other skin lesions are prominent. Death usually results without any particularly striking features.

"At autopsy two types of conditions are recognizable: In the animals presenting foul mouth and bloody diarrhea the chief interest centers in the lower bowel and rectum, which exhibit an intense hemorrhagic appearance. With these animals dying rapidly from convulsions the only visible abnormality of the alimentary tract is the presence in the duodenum of one or more large ulcers."

This pathological condition was induced by these workers by feeding a diet of boiled peas, cracker meal, and cottonseed oil. It was also induced, but with much greater difficulty, with a diet of meat, cracker meal, and lard.

"Blacktongue" appears to have been first described in 1852 from Munich by Hofer as "typhoid of dogs."<sup>2</sup> Hofer mentions among the symptoms an abrupt onset, vomiting, retching, and loss of appetite. The mucous membrane of the mouth is described as either dirty red or yellow, with an evil smelling saliva drooling from the angles of the mouth. He remarks that he never observed the typical typhoidal stool, but in pernicious cases there was a bloody discharge. At necropsy he found congestion of the gastric and intestinal mucosa with ulceration scattered throughout the digestive tract.

Nearly 50 years later, Klett (1899), without knowing of Hofer's observation, made a careful and extensive clinical study of the condition in the course of an outbreak at Stuttgart. A brief summary of Klett's clinical observations follows:

Onset very abrupt with vomiting, followed by loss of appetite and by thirst. The dog is indifferent to his surroundings, and his strength is diminished.

The buccal, less often the pharyngeal, mucosa is brownish or dark red with erosions and pustules. The mucosa of the tongue is similarly altered. In advanced cases the mucosa of the mouth, pharynx, and tongue becomes covered with a thick chocolate-colored coating. The mouth invariably gives off an extremely foul odor.

Constipation and constipated stools are the rule, but in some cases there is uncontrollable diarrhea of a bloody character.

The conjunctiva is invariably injected.

The temperature is not above normal. In some cases convulsions of a clonic character may occur.

Other European students have confirmed and, in some details, extended Klett's observations, as the result of which it appears that

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<sup>2</sup> Hofer's "Typhus der Hunde" has in the literature been erroneously translated into "dog typhus." The German typhus is the English typhoid, and it was typhoid that Hofer meant.

some variation in the severity of the disease, but more particularly in the prominence or severity of the individual manifestations, may occur. Thus the inflammation of the mouth may be slight—it may occur without any erosions or ulcerations; on the other hand, it appears that the inflammation may be so severe as to lead to destruction (gangrenous) of the anterior part of the tongue. Similarly the gastric, duodenal, and rectal mucosa may be but slightly congested or it may be severely inflamed and ulcerated.

No extensive study of the disease as it occurs in dogs in the United States seems to have been made. There are, however, several published notes describing the salient features of the disease. The following outline is based on these American accounts and on our own observations.

Onset is rather abrupt, with lassitude, loss of appetite, occasionally vomiting, and thirst; the animal, though trying often, may be unable to take water. The mouth early gives off a characteristic offensive, nauseating odor and soon becomes sore. Salivation develops early, and the drooling saliva may become bloody.

The buccal and lingual mucosa becomes more or less extensively injected and inflamed. In some cases the congestion becomes very marked, the mucosa then presenting more or less extensive purplish red areas. The tongue, more particularly the free anterior portion, may be thus affected; the margin may be bright red. Both tongue and cheeks may become covered with a dirty, gray, slimy coating suggestive of a diphtheritic membrane. It is probably this appearance that led Kerr (1914) to suggest the name "canine diphtheria" for the disease.

The mouth may present erosions and ulcers. Vomiting may occur, and either constipation or diarrhea may be present; constipation is more often a symptom of the onset, diarrhea of the later stages. When there is diarrhea the stools may be bloody, particularly in cases with fatal termination. The temperature may at times be considerably elevated.

The disease appears to end in death in about 75 per cent of cases, running its course in these in some four to eight days.

The American literature on the post-mortem findings is extremely meager. The following notes are of two necropsies made by us at Spartanburg, S. C., on August 11, 1921. The dogs were Chesapeake Bay retrievers, one a male, the other a female, both under 2 years of age. One had died 24 hours and the other 10 to 15 hours previously.

In both animals the lingual and buccal mucosa was found markedly but unevenly congested, the congestion involving the mucosa of the lips and opposing gums. There was also some congestion of the mucosa of the larynx and epiglottis.

The gastric mucosa showed a patch of moderate congestion in the region of the pylorus.

In one of the dogs there was marked congestion of the mucosa of the large gut throughout its whole length, including the rectum; in the other no gross change in this part of the bowel was apparent.

The contents of the gastro-intestinal tract was small in amount; in one it was seemingly of a mucous nature, in the other more watery. In both it was yellow-tinged, probably from the medication administered just before death. This yellow tinting was also observed to affect the lingual mucosa and the buccal secretion.

Examination of the lungs, heart, liver, spleen, and kidneys disclosed no gross lesions.

The disease has quite generally been regarded as infectious. This view seems to be based mainly on its occasional epizootic occurrence and in a measure on the observation that at times after the occurrence of one case in a kennel a considerable number, perhaps all, of the other dogs are affected. More commonly, however, none of the other dogs is attacked, and one finds such observations as the following: "The disease seems to be infectious, and yet I have seen dogs drink and eat with the dogs affected with sore mouth and not contract the disease" (Heiny). "We have five or six dogs of our own and always have from three to five cases of black tongue at the hospital, but have never had more than one case of it in our own dogs" (Browning).

The results of the recorded experimental attempts at transmission from sick to well dogs do not lend much support to the conception that the disease is an infection, for with one or two doubtful exceptions, these attempts have frankly failed.

Just as Chittenden and Underhill recognized the resemblance of their experimentally induced condition in dogs to pellagra, so there have been those who have been struck by the resemblance of the naturally occurring disease "black tongue" to the disease in man.

The first, as far as we have been able to find, to call attention to this is Spencer, of Concord, N. C. In a brief note he states that "after studying these two maladies, I am forced to the conclusion that the so-called black tongue is canine pellagra and have carried on a limited number of experiments to that end."

Four years later, Cary (1920), of Auburn, Ala., recognizing the resemblance of black tongue to the experimental condition reported by Chittenden and Underhill, classed "black tongue" among deficiency diseases and referred to the similarity of the manifestations of "sore mouth" in dogs to those of pellagra in man.

Of interest in this connection is the suggestion by Saunders (1920), of Waco, Tex., of some connection between "sore mouth of dogs" and pellagra. He writes as follows: "Some five years ago I bought a very fine dog in New Jersey and brought him to Texas. The second year in Texas he died with what the veterinarian pronounced 'sore mouth.' Now, a dog dying with sore mouth was as novel to me as was

a man dying with pellagra. I noticed that my dog was losing hair from his front legs (paws). In commenting on the cause of my dog's death with my friends I find that it is a relatively common disease, and that there is a large strip of country east of town on a branch called the Tehuacana, where they can not have dogs, as they all die of the sore mouth. Now, this strip of country has furnished some 40 or 50 pellagrins to the near-by doctors for treatment. The question is, How much the dog plays in the etiology, or are they both, man and dog, infected from the same source, or is the sore mouth a different disease and is it a coincidence that they are found here side by side?"

At this juncture it may be remarked that black tongue seems to have a geographic distribution in the United States singularly like that of pellagra. Seemingly it occurs principally, if not exclusively, in the South. Seasonally it is reported to occur most frequently in summer and autumn and to affect cur dogs less than those of higher grade. There is some evidence that it may occur more than once in the same animal.

The resemblance of black tongue to the experimental condition described by Chittenden and Underhill is so striking that it appears to us well-nigh certain that the two are identical; but before this identity can be accepted as definitely established, much additional work will have to be done. The possibility, if not the probability, that black tongue in dogs may prove to be the analogue of pellagra in man emphasizes the importance of such further investigations. In this the individual practitioner can take an important part by observing and recording the circumstances of the occurrence of this interesting condition in dogs and the efficacy of a strictly dietary treatment consisting of milk, eggs, and fresh meat.

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## HEALTH WORK IN A MODEL VILLAGE.

### SECOND ANNUAL REPORT OF THE DEPARTMENT OF HEALTH, PERRY POINT, MD.

By H. I. HUNTINGTON, Assistant Bacteriologist, United States Public Health Service.

#### Introduction.

The United States Public Health Service owns a tract of land comprising 516 acres adjoining the town of Perryville, Md. This reservation, upon which was constructed during the war an enormous ammonium nitrate plant and a model village to house the employees, was transferred to the Public Health Service by an act of Congress in 1919. The reservation, known as Perry Point, forms a peninsula of land projecting into the Chesapeake Bay at the point where the Susquehanna River and Mill Creek empty.

The activities of Perry Point may be divided under three heads:

*Hospital.*—The United States Public Health Service Hospital No. 42, known now as the United States Veterans' Bureau Hospital, is located in the center of the reservation. The capacity of the hospital is 430 beds; the type of patients received is psycho-neurotic. Closely connected with the hospital is the Veterans' Bureau Pre-Vocational School. There is now under construction another hospital of 300-bed capacity.

*Village.*—The village consists of 200 houses, store buildings, a theater, club house, schoolhouse, and fire department. The supervision and custody of the village comes directly under the Medical Officer in Charge.

*Supply depot.*—The supply depot is a branch of the purveying service. It occupies nearly all the large plant buildings, storing vast quantities of hospital supplies and equipment and motor transportation equipment. This material is shipped to the various hospitals and stations of the Public Health Service. During the year 1921, 17,890,114 pounds of supplies were received at this station and 10,330,943 pounds were shipped away.

#### Organization.

The organization of a whole-time health department dates back to January, 1920, when the writer was detailed to Perry Point to establish a health department and to carry on its activities. The